Claims

1. A polymer comprising an optionally substituted repeat unit of formula (I):

(I)

wherein each R is the same or different and represents H or an electron withdrawing group; and each R^1 is the same or different and represents a substituent.

2. A polymer according to claim 1 wherein at least one R^1 is a solubilising group.

3. A polymer according to claim 1 or 2 wherein each R^1 is the same or different and is independently selected from the group consisting of optionally substituted C_{1-20} alkyl, C_{1-20} alkoxy, aryl and heteroaryl.

4. A polymer according to any preceding claim comprising an optionally substituted aryl or heteroaryl second repeat unit.

5. A monomer comprising a repeat unit of formula (II):

(II)

wherein R and R^1 are as defined in any one of claims 1-3 and each X independently represents a polymerisable group.

6. A monomer according to claim 5 wherein each X is the same or different and is selected from the group consisting of boronic acid groups, boronic ester groups, borane groups and halide functional groups.

7. A method of forming a polymer comprising the step of polymerising a monomer according to claim 5 or 6.

8. A method according to claim 7 wherein each X is the same or different and is a halide functional group, and the polymerisation is performed in the presence of a nickel complex catalyst.

9. A method according to claim 7 comprising the step of polymerising:

(a) a monomer of formula (II) wherein each X is a boron the same or different and is a boron derivative functional group selected from a boronic acid, a boronic ester and a borane, and an aromatic monomer having at least two reactive halide functional groups; or

(b) a monomer of formula (II) wherein each X is the same or different and is a reactive halide functional group, and an aromatic monomer having at least two boron derivative functional group selected from a boronic acid, a boronic ester and a borane; or

(c) a monomer of formula (II) wherein one X is a reactive halide functional group and the other X is a boron derivative functional group selected from a boronic acid, a boronic ester and a borane,

wherein the reaction mixture comprises a catalytic amount of a palladium catalyst suitable for catalysing the polymerisation of the aromatic monomers, and a base in an amount sufficient to convert the boron derivative functional groups into boronate anionic groups.

10. An optical device comprising a polymer according to any one of claims 1-4.

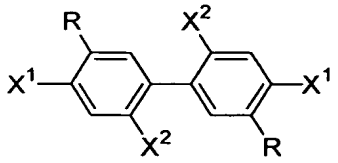
11. An optical device according to claim 10 comprising an anode, a cathode and a layer of the polymer according any one of claims 1-4 located between the anode and the cathode.

12. An optical device according to claim 11 that is an electroluminescent device.

13. A switching device comprising a polymer according to any one of claims 1-4.

14. A switching device according to claim 13 that is a thin film transistor.

15. An optionally substituted compound of formula (IV):



(IV)

wherein R is as defined in any one of claims 1-3; each X^1 and each X^2 are the same or different and represent a leaving group capable of participating in a transmetallation reaction and X^2 has an electronegativity less than that of X^1.

16. Preferably, each X^1 and X^2 is independently a halogen.

17. A method of forming a monomer of formula (VI) from a compound of formula (V) according to the following scheme::

(V) (VI)

wherein the method comprises reacting the compound of formula (V) with a transmetallating agent followed by reaction with a compound of formula LG-Y-LG, wherein X^1 and R are as defined in claim 15; each X^3 is the same or different and represents a leaving group capable of participating in a transmetallation having an electronegativity less than or the same as that of X^1; Y represents a divalent residue comprising a backbone of 1-3 atoms; and each LG is the same or different and represents a leaving group.

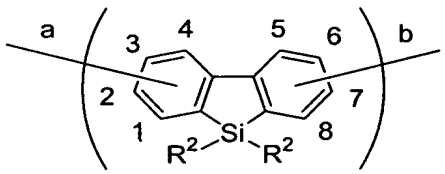
18. A method according to claim 17 wherein Y comprises a single atom in its backbone selected from the group consisting of $-CR^3{}_2$-, $-SiR^3{}_2$-, $-NR^3$-, $-PR^3$-, $-GeR^3{}_2$-, $-SnR^3{}_2$-, O and S, wherein R^3 is selected from the group consisting of optionally substituted alkyl, alkoxy, aryl and heteroaryl.

19. A method according to claim 17 or 18 wherein each X^3 is the same or different and has an electronegativity less than that of X^1.

20. A method according to any one of claims 17-19 wherein each LG is the same or different and is a halogen.

21. A method according to any one of claims 17-20 wherein the transmetallating agent is a compound of formula R^4-M wherein R^4 is alkyl or aryl and M is a metal.

22. A polymer comprising an optionally substituted first repeat unit of formula (VII):



(VII)

wherein each R^2 is the same or different and represents a substituent; the R^2 groups may be linked to form a ring; and bond (a) is not linked to the 2-position of the repeat unit of formula (VII).

23. A polymer according to claim 22 wherein bond (b) is not bound to the 7-position of the repeat unit of formula (VII).

24. A polymer according to claim 22 or 23 wherein bond (a) is bound to the 3-position of the repeat unit of formula (VII).

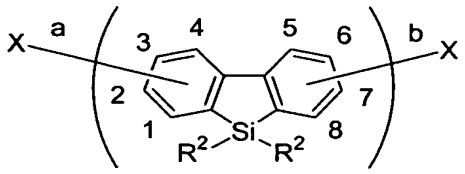
25. A polymer according to any one of claims 22-24 wherein bond (b) is bound to the 6-position of the repeat unit of formula (VII).

26. A polymer according to any one of claims 22-25 wherein at least one R^2 is a solubilising group.

27. A polymer according to any one of claims 22-26 wherein each R^2 is the same or different and is selected from the group consisting of optionally substituted C_{1-20} alkyl, C_{1-20} alkoxy, aryl and heteroaryl, preferably a C_{4-10} alkyl, more preferably n-hexyl or n-octyl.

28. A polymer according to any one of claims 22-27 wherein the polymer comprises an optionally substituted aryl or heteroaryl second repeat unit.

29. An optionally substituted monomer of formula (VIII):



(VIII)

wherein each R^2 is as defined in claim 22, 26, or 27; each X is as defined in claim 5 or 6 and at least one X is not linked to the 2-position of the repeat unit of formula (VIII).

30. An electroluminescent device comprising an anode, a cathode and an electroluminescent layer located between the anode and cathode wherein the electroluminescent layer comprises a polymeric host material comprising an optionally substituted first repeat unit of formula (IX) and a luminescent dopant

(IX)

wherein R^1 is as defined in any one of claims 1-3.

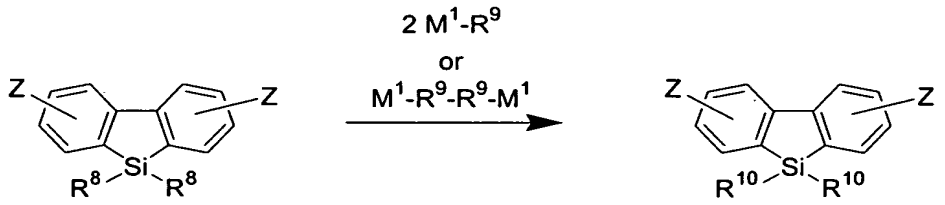
31. An electroluminescent device according to claim 30 wherein the repeat unit of formula (IX) is linked through its 3- and 6- positions.

32. An electroluminescent device according to claim 30 or 31 wherein the polymeric host material comprises a second repeat unit

33. An electroluminescent device according to any one of claims 30-32 wherein the second repeat unit comprises a hole transporting material.

34. An electroluminescent device according to any one of claims 30-33 wherein the luminescent dopant is phosphorescent.

35. A method of forming an optionally substituted compound of formula (X) according to the following process:



(X)

wherein each R^8 is independently selected from the group consisting of C_{1-20} alkyl and aryl; each R^9 is different from R^8 and is independently selected from the group consisting of C_{1-20} alkyl, aryl and heteroaryl; M^1 is a metal; and Z is a reactive group capable of undergoing reaction with M^1-R^9.

36. A method according to claim 35 wherein M^1 is lithium.

37. A method according to claim 35 wherein R^8 is methyl

38. A method according to claim 35 wherein Z is trialkylsilyl, more preferably trimethylsilyl.

39. A method according to claim 35 wherein, in the case of reaction with M^1-R^9, the two groups R^{10} are not linked to form a ring.